Drone Pre-Flight Checklist:

1. Ensure all arms of the drone are extended to their maximum range.
2. At the beginning of each arm ensure the clamps are fastened by turning them clockwise to ensure the arms of the drone do not revert to initial position resulting in a crash.
3. Unfold propellers and inspect to see if the propellers have any form of damage or buildup of foreign materials.
4. Place the battery inside the battery holding dock and ensure you hear the click that dictates the battery has been properly docked. Give a gentle tug on the batteries holding strap to ensure it doesn't eject from the dock.
5. Power on the battery and ensure its properly charged by pressing the button on the battery once, then holding for five seconds and release. The battery should have all lights green.
6. Position the drone in an open area for takeoff, away from buildings, objects and people.
7. Ensure the brackets holding the landing bar are not loose, tighten them if you notice any loose screws on landing bars.
8. Activate Auto-Hover or Return To Home henceforth in this document abbreviated as RTH in the DJI Drone Controller in case of signal loss.
9. Stand at least 8-10ft away from the drone when taking off, check for, warn and ensure any other bystanders are at the appropriate distance before take off.

Mid-Flight Checklist

1. Always ensure you can visually see the drone, use other tools provided in order to ensure Visual Line of Sight is never lost.
2. Do not fly over any person for any reason, under part 107 our drones don't belong to any category that is allowed to fly over people. Strictly vegetation!
3. Keep attention at all times to battery life and distance for GNSS signal. Take enhanced notice of drone position when battery hits 30%. Make sure you have planned the field for shorter runs to make sure you are able to land the drone when the battery is at or less than 15%. Performance and lift are drastically reduced at this battery range, try to land safely and immediately.
4. Ensure you keep a proper height and are paying attention to the drone during RTH, RTH feature uses the quickest way back to home position and doesn't account for obstacles.

Post Flight Checklist

1. Use fresh water to wash drone off of any chemicals or debris.
2. Fill spray containers with fresh water and enable spraying on the drone to flush out chemicals within the spray lines and pumps.
3. Fold in drone arms and propellers, remove battery and tank, if heading to next job or returning to shop, strap down drone to prevent damage during travel.
4. Remove nozzles and clean them with fresh water and a sewing needle for nozzle tips if no compressed air blower is available.

Fertilizer Education

I. Essential Elements

A. **Nitrogen (N)**: Nitrogen is of primary importance in citrus production, directly influencing yield and quality. When N is in short supply, growth may be limited, and the foliage becomes pale green or yellowish in color.

B. **Calcium (Ca)**: Generally, alkaline soils have an abundance of Ca.

C. **Magnesium (Mg)**: Magnesium is needed to produce chlorophyll. A deficiency produces a characteristic chlorotic pattern and may cause premature defoliation. Dolomitic limestone is often used to correct acidity and supplies slowly available Mg.

D. **Sulfur (S)**: Sulfur is supplied through fertilizer materials such as ammonium sulfate, superphosphate, and sulfates of micronutrient metals.

E. **Iron (Fe)**: chlorotic patterns due to Fe deficiency appear first on young shoots. Iron deficiency occurs in plants growing in alkaline soil, waterlogged soil, or in soil very low in organic matter.

F. **Copper (Cu)**: Copper should not be added to fertilizers if copper sprays are used, or if a copper test shows adequate levels. For new plantings on virgin soil, Cu should be added to the fertilizer.

G. **Zinc (Zn)**: Severe Zn deficiency restricts growth and reduces yields.

H. **Manganese (Mn)**: a mild form of chlorosis has been associated with Mn deficiency on acidic, sandy soils.

I. **Boron (B)**: Boron deficiency is caused when growers use fertilizers without micronutrients, or following a long drought. Boron can be applied as a soil or foliar application but not both because only a small amount of boron is required.

J. **Molybdenum (Mo)**: a symptom described as “yellow spot,” is characteristic of Mo deficiency. This element is less available in acidic than in slightly alkaline soils, unlike many other nutrients.

II. Fertilizer Sources

A. **Granular sources**: These are usually bulk blended into multi-analysis blends for spreading in citrus groves. Uniform particles size is required to prevent segregation of mixtures while in transit. Most nutrient forms are readily water soluble and rapidly available for tree uptake. Solid fertilizers are applied with conventional spreading equip- ment or newer VRT.

B. **Solution sources:** Solution fertilizers are free of solids and are made by dissolving readily-soluble sources of plant nutrients in water. Nutrient sources

used to prepare solu- tions include ammonium nitrate, urea, potassium nitrate, potassium chloride, ammonium polyphosphates and phosphoric acid. These materials are used in fertigation.

C. **Foliar N Sources:** Spray mixtures containing urea or nitrate N sources can be used to provide a portion of the tree nitro- gen requirements, especially during the summer months when leaching potential is greatest. However, tank mixing N sources with pesticides, oil, and other products should be approached with caution, as urea is known to be phytotoxic at higher rates, particularly in combination with oil.
D. **Slow release sources**: These materials have limited water solubility that release plant available N during decomposition. These fertilizers are grouped according to their mode of release in soil.

Safety When Loading Fertilizer

Always load fertilizer into application equipment away from wells or any surface water bodies when possible. An asphalt or concrete pad with rainfall protection permits easy recovery of spilled fertilizer. When possible, use a tarp and load at random locations in the field. Random loading locations prevent the build up of nutrients on one specific site.

To minimize the potential for spilled materials to pollute surface waters, locate mixing and loading activities away from groundwater wells, ditches, canals, and other areas where runoff may carry spilled fertilizer into surface water bodies. If such areas cannot be avoided, protect wells by properly casing and capping them. Use concrete or asphalt berms to keep spills out of surface waters. Recover and apply any spilled materials to the application site.

Don’t load fertilizers on chemical mix-load stations because of the potential for cross-contamination. Fertilizers contaminated with pesticides could cause crop damage or generate hazardous waste.

Fertilizer Safety

To begin, watch the following videos; https://www.youtube.com/watch?v=7bNMbpYzj6Q

https://www.youtube.com/watch?v=iGv26vFXzIg&t=14s

1. Protecting your body when handling a chemical product is always recommended whether the product is classified as hazardous or not. Avoid direct contact with skin and eyes.
2. Always read the label of the product you are using.
3. When transporting, make sure the container is secured properly using a ratchet strap.
4. Always wear gloves and eye protection when loading in containers.
5. Make sure clean water tank is always available to wash off any material that gets on skin.
6. When the drone is applying fertilizer, make sure to always be at least 100 feet away from where it is working.
7. Ensure that all machinery has been accurately calibrated **before** applying materials in the field.

Equipment Usage:

Remote Controller

To turn on the Remote Controller tap then hold the power button until the controller turns on.

Ensure antennas on the back are flipped up and external RTK module is inserted.

Insert External Battery in the back by hitting the bottom button and then inserting the External Battery, to remove the External Battery follow the same beginning step and then hit the button inside the battery housing to release an inserted battery.

Refer to DJI Smart Controller Manual about specific button usage not covered in training.

DJI AGRAS Software

Planning a Field

First hit the "Plan Field" button at the bottom left of the home screen.

Select any field planning option of the three available depending on the attachments or equipment connected.

Walk with RC can only be done without aircraft connection and no external RTK module inserted, Walk with RTK Module can only be done with RTK module inserted and no aircraft connection, Fly Aircraft can be done only when the aircraft is connected and no external RTK module inserted. Each offer a different way to plan a route on the field. Fly Aircraft is superior to the other routing options as you can see boundaries or obstacles with the drone camera and plan the route accordingly.

When planning any field ensure the RTK GNSS Accuracy is within 3' otherwise you cannot take off.

Waypoints are the boundary limits you set on the entire field, you can add a waypoint by hitting the add waypoint button on screen or the C2 button on the back right of the controller. Complex fields need more waypoints, always try to plan the field with 50' boundary border Incase GPS imaging is old and inaccurate. Old images won't account for vegetation growth, river erosion or other natural shifts within the landscape or changes within the landscape since the GPS image was taken. Use the boundary border as a safety precaution against terrain inconsistencies, you may have to manually spray this border depending on obstacles and landscape shifts.

Obstacle mode can be enabled with the C1 button, and then added with the C2 button. You can plan square or polygonal obstacles with C2 the same way you can plan waypoints, you can also hit the round button to create a circular obstacle. Circular obstacles can be enlarged by taking the outer point away from the center of the obstacle circle.

At the end of the training, which also has a hands-on portion, there is a 10 question quiz about each section that each trainee is required to score at least an 80% on. Failure to successfully complete or receive a satisfactory score results in retaking the course up to 3 times in one calendar year. The quizzes can be provided upon request from the FAA.

The last section of examination requires that the examinee go over the drone and tell the examiner what each part does.